CLAIMS

What is claimed is:

1. A method of cooling an apparatus, having a surface, with a coolant and a porous member, the method comprising:

providing a porous member including:

selecting a substantially non-porous laminate preform;

laminating said laminate preform to form a laminated structure with a pore forming member disposed therein;

removing said pore forming member to form a selected pore;

forming a coolant flow area near at least a portion of said surface, including positioning the porous member a distance from said portion of said surface of said apparatus;

flowing the coolant through said coolant flow area; and

transporting a portion of said coolant through said porous member.

2. The method of claim 1, further comprising:

selecting a coolant to flow in said coolant flow area;

wherein said coolant is able to absorb thermal energy from the apparatus.

3. The method of claim 1, further comprising:

selecting a coolant able to transpire through a pore of the porous member.

4. The method of claim 1, wherein transporting a portion of said coolant through said porous member includes transpiring a portion of said fluid through a pore of said porous member; and

wherein said transpiration cools the apparatus.

5. The method of claim 1, wherein flowing the coolant through the coolant flow area allows the coolant to absorb thermal energy from the apparatus;

wherein transporting the coolant through the porous material includes:

transpiring said coolant including absorbed thermal energy through a pore of said porous member; and

cooling the apparatus when said coolant material is transpired through said pore.

6. The method of claim 1, wherein forming a coolant flow area includes:

selecting said distance to allow the coolant to flow through said coolant flow area; and

wherein said distance allows the coolant to absorb a portion of thermal energy from the apparatus and move it to an outside of said porous member.

7. The method of claim 6, wherein said porous member includes an inside and said outside wherein said inside is nearer said exterior of the apparatus than said outside of said porous member; and

wherein said portion of said coolant is transported from said inside to said outside of said porous member.

8. A transpirationally cooled apparatus, comprising:

a member for providing a support; and

a skin surrounding said member including a first side and a second side;

wherein said skin is spaced a distance from said member to define a coolant conduit;

wherein said skin defines a pore extending between said first side and said second side;

wherein a coolant disposed in said coolant conduit is able to move through said pores.

9. The transpirationally cooled apparatus of claim 8, wherein said skin generally defines a leading edge of a structure.

10. The transpirationally cooled apparatus of claim 9, wherein said structure is selected from a leading edge of a turbine fan, a leading edge of a propeller, a leading edge of an impeller, a leading edge of a wing, a leading edge of an aircraft, and combinations thereof.

11. The transpirationally cooled apparatus of claim 8, wherein said skin is formed of a material including ceramic matrix composites.

12. The transpirationally and cooled apparatus of claim 8, wherein said skin is formed of composite materials including a reinforcement fiber extending through said skin.

13. The transpirationally cooled apparatus of claim 12, wherein said pores are formed in said skin without substantially damaging said reinforcing fiber.

14. The transpirationally cooled apparatus of claim 8, further comprising:

a coolant pressurizing system, including a coolant source, and an apparatus for providing said coolant through said coolant conduit at a pressure greater than a pressure on at least one of said first side and said second side of said skin;

wherein said coolant flows from said coolant conduit to a side of said skin opposite said coolant conduit.

15. The transpirationally cooled apparatus of claim 8, wherein said coolant removes thermal energy from said skin to maintain said skin at a selected temperature.

16. The transpirationally cooled apparatus of claim 8, wherein said skin includes:

forming a laminate preform of selected layers;

positioning pore forming members through said layers in a selected orientation and number;

processing said laminate preform to substantially fix each of said selected layers relative said each other of selected layers; and

removing said pore forming members to leave said pores in said skin.

17. A method of cooling a structure, comprising:

forming a selected pore in a structure;

disposing said structure relative to a heat flux such that a portion of said structure is able to be heated; and

moving a coolant through said pores to maintain said structure at a selected temperature;

wherein said selected temperature substantially maintains a selected property of said structure.

18. The method of claim 17, wherein:

said structure includes an interior and an exterior;

said interior is a hot wall to which said coolant is flowed.

19. The method of claim 18, wherein said coolant removes thermal energy from said structure as said coolant flows to said hot wall.

20. The method of claim 17, wherein maintaining said structure at a selected temperature includes:

cooling said structure;

wherein cooling said structure includes removing thermal energy from said structure with said coolant.

21. The method of claim 20, wherein removing thermal energy from the structure is selected from a phase change of the coolant, sheer forces removing the coolant, or combinations thereof.

22. The method of claim 17, wherein forming a selected pore in a structure includes forming pores with selected properties including allowing a substantially one directional flow of the coolant.

23. The method of claim 21, wherein said selected property is selected from a size, a shape, a directionality, and combinations thereof.

24. The method of claim 17, wherein forming a selected pore in a structure includes:

providing a laminated preform including a plurality of layers positioned substantially adjacent one another;

disposing a pore forming member in a selected plurality of said plurality of layers;

processing said laminated preform to substantially fix said plurality of layers relative one another; and

removing said pore forming members to provide said selected pore.